EVALUATION OF POSSIBILITY OF APPLICATION OF ROLLED SHEETS, MADE OF STEELS OF DIFFERENT COMPOSITIONS FOR MANUFACTURING OF BOILERS FOR RAILWAY TANK CARS

V.G. Gavrilova, Associate Prof., PhD (Eng.), Priazovskyi State Technical University, A.B. Gogol, chief offorge stamping laboratory NIOMET «Azovzagalmash», V.A. Rusetsky, Associate Prof, PhD (Eng.), Priazovskyi State Technical University

The expediency of research is substantiated by comparative tests of steel, sheets manufactured by thermomechanical and normalizing rolling methods, made in accordance with the standards E36, EN 10025-4 S460ML, 9MnSi5 with the objective of determining the opportunity for their use for manufacturing parts of Railway cars.

The study of macro, microstructure and mechanical properties of high strength shipbuilding steel E36 after various modes of heating in the range 920-980 °C showed high values of strength properties and unsatisfactory results of values of impact energy at temperatures below 930 °C due to significant banding structure, while at higher temperatures - due to rapid

growth of grains. Thus, the use of such rolled steel for stamping railway tanks bottoms at temperatures 950-980 °C is not advisable.

In tests of steel samples, made in accordance with the EN10025-4 S460 ML standard, it was determined that by their heating to stamping temperature (normalization) impact resilience is reduced, therefore, the use of such steel for containers, working under pressure, is not recommended, either.

Comparison of mechanical properties of steel 9MnSi5 of different batches showed that after the initial thermomechanical rolling the mechanical properties of this steel did not meet the requirements of GOST 19281-91 and customer's requirements, according to which, the amount of impact energy must be not less than 27 J across rolled steel and 41 J along the rolled steel. Heating for stamping after thermomechanical, rolling also does not provide the desired results. Optimal toughness values obtained after normalizing rolling and heat heating for stamping of heat samples into which additional microadditives of vanadium and niobium were introduced.

At manufacturing of bottoms of tank cars by hot stamping the stamping, temperature must be within the range of 930-950 °C. In case of temperature excess above it there is the yield strength reduction up to 360 MPa and a tensile strength reduction up to 520 MPa.

Tempering of steel 9MnSi5 after heating for stamping at temperature 580-620 °C slightly reduces the strength characteristics, but they remain high enough and meet the requirements of the standard. At the same time, impact work after tank cars launching is increased by 3-6 J. To remove the common tension in the metal of car's boiler tempering at 580-600 °C is required.

The results can be applied for developing the technology of thermal strengthening of boilers of Railway tank cars.